


## 4-1

## Understanding Slope

**What You'll Learn**

To find the slope of a line from a graph or table

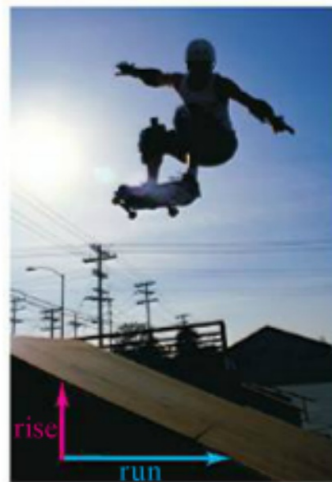
 **New Vocabulary** slope, slope of a line

**Why Learn This?**

You can use slope to describe the steepness of an incline or hill. The steepness of a ramp is the ratio of the vertical change to the horizontal change. In math, slope is a number that describes the steepness of a line.

You can also use slope to describe rate of change of a quantity.

$$\text{slope} = \frac{\text{vertical change}}{\text{horizontal change}} \quad \begin{array}{l} \leftarrow \text{rise} \\ \leftarrow \text{run} \end{array}$$



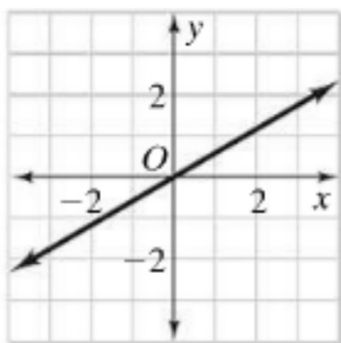
Slope describes the steepness of lines in the coordinate plane. You can find the slope of a line by subtracting the coordinates of any two points on the line.

**Copy this into your notes.**

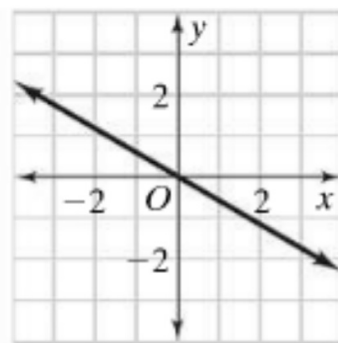
**KEY CONCEPTS** Slope of a Line

$$\text{slope of a line} = \frac{\text{change in } y\text{-coordinates} \leftarrow \text{rise}}{\text{change in } x\text{-coordinates} \leftarrow \text{run}}$$

The direction of the slant of a line indicates a positive or a negative slope.



Positive slope



Negative slope

***Let's watch a movie to further your understanding of slope.***

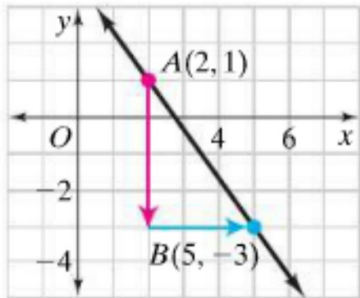
***I will pass out an anticipation guide for you to complete as you watch this movie.***



When you find the slope of a line, the first  $y$ -coordinate you use for the rise must belong to the same point as the first  $x$ -coordinate you use for the run.

### EXAMPLE Finding the Slope of a Line

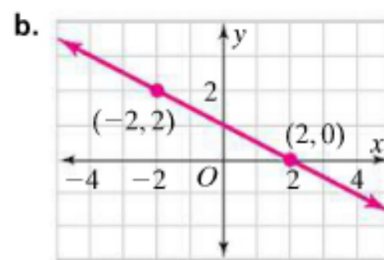
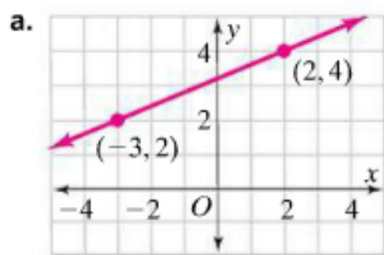
- 1 Find the slope of the line in the graph below.



$$\begin{aligned} \text{slope} &= \frac{\text{change in } y\text{-coordinates}}{\text{change in } x\text{-coordinates}} \\ &= \frac{-3 - 1}{5 - 2} \quad \leftarrow \text{Subtract coordinates of } A \text{ from coordinates of } B. \\ &= \frac{-4}{3} \text{ or } -\frac{4}{3} \quad \leftarrow \text{Simplify.} \end{aligned}$$

### Quick Check

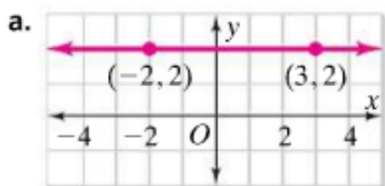
1. Find the slope of each line.



Some lines have slopes that are neither positive nor negative.

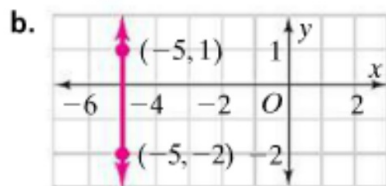
### EXAMPLE Slopes of Horizontal and Vertical Lines

2 Find the slope of each line. State whether the slope is zero or undefined.



$$\text{slope} = \frac{2 - 2}{3 - (-2)} = \frac{0}{5} = 0$$

The slope of a horizontal line is zero.



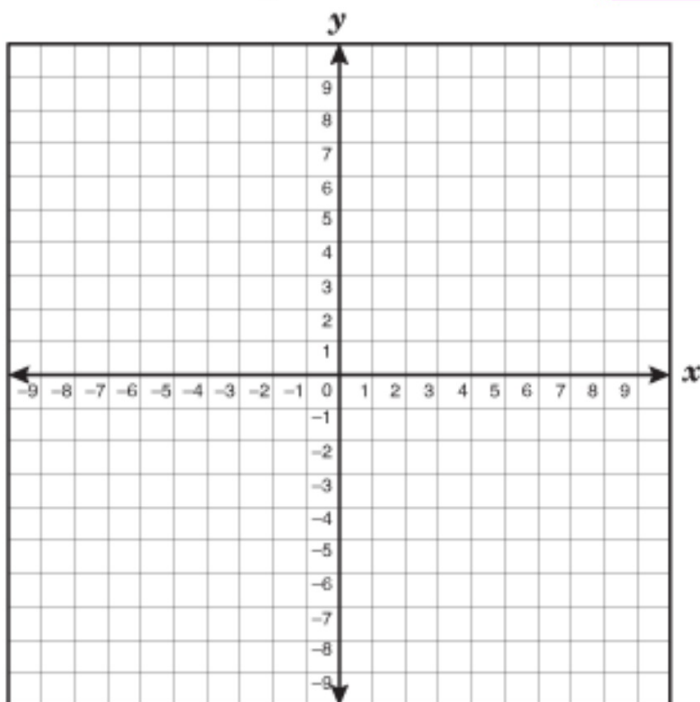
$$\text{slope} = \frac{1 - (-2)}{-5 - (-5)} = \frac{3}{0}$$

Division by zero is undefined. So, the slope of a vertical line is undefined.

*Copy this into your notes.*

### Quick Check

2. Find the slope of a line through the points (3, 1) and (3, -2).  
State whether the slope is zero or undefined.

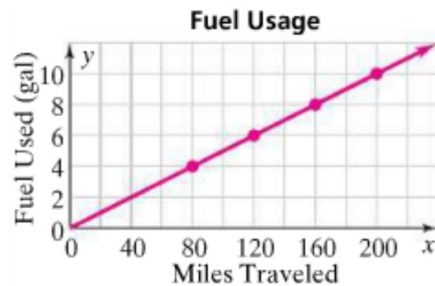


When you graph some data, all the points lie on a line. For such data, you can find slope, or rate of change, using a table.

### EXAMPLE Finding Slope From a Table

Miles Traveled	Fuel Used (gallons)
80	4
120	6
160	8
200	10

- 3 Graph the fuel-usage data at the left. Connect the points with a line. Then find the rate of change.



← Draw the graph.

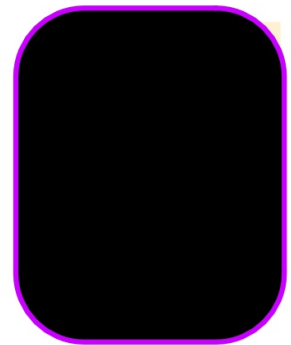
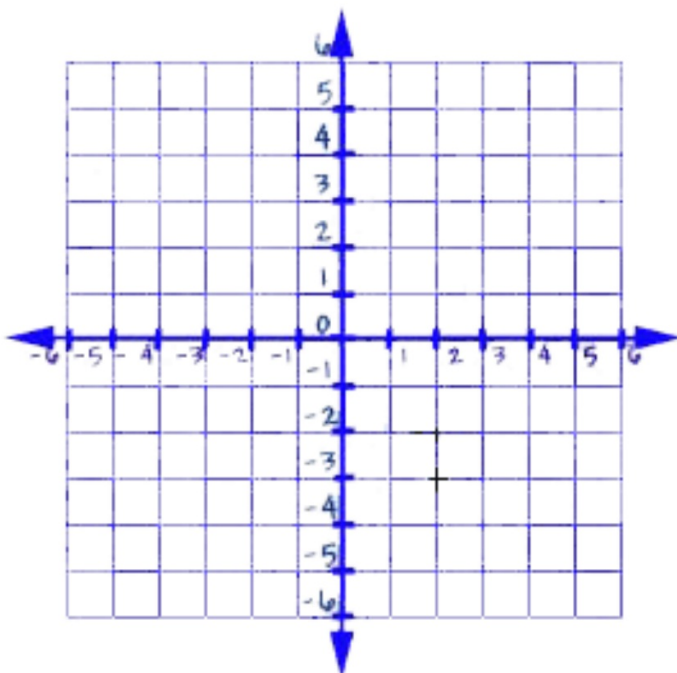
$$\begin{aligned} \text{rate of change} = \text{slope} &= \frac{\text{change in } y}{\text{change in } x} = \frac{10 - 4}{200 - 80} \quad \leftarrow \text{Use coordinate of two points.} \\ &= \frac{6}{120} = \frac{1}{20} \quad \leftarrow \text{Subtract and simplify.} \end{aligned}$$

The amount of fuel used is 1 gallon for every 20 miles traveled.

### Quick Check

3. Graph the data in the table and connect the points with a line. Then find the slope.

x	-1	0	1	2
y	2	0	-2	-4



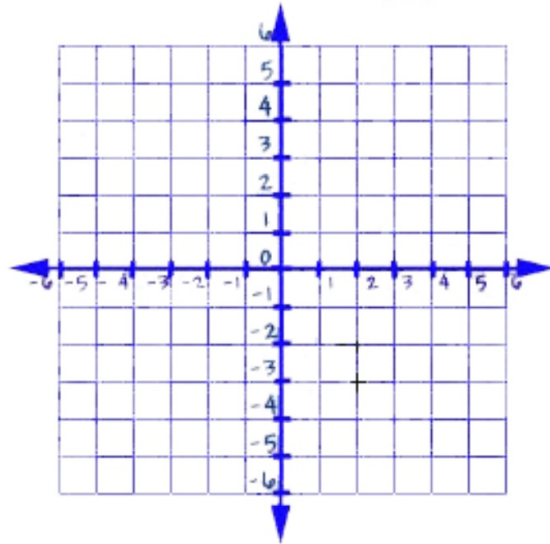
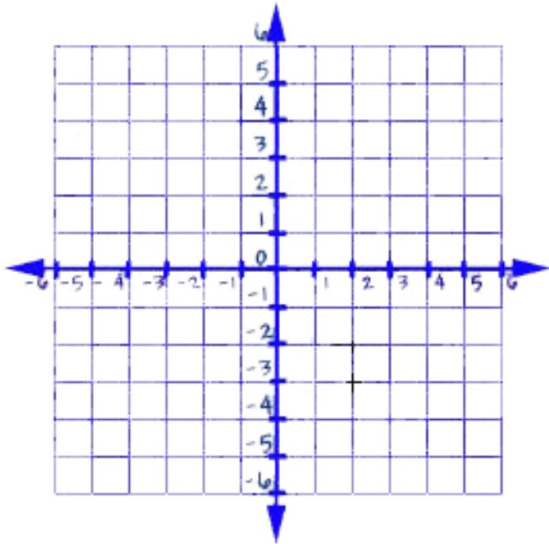
## Check Your Understanding

1. **Vocabulary** The slope of a line is the rise over the ?.

Find the slope of the line that passes through each pair of points.

3.  $(0, 3)$  and  $(6, 1)$

4.  $(2, 2)$  and  $(6, -1)$

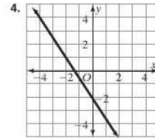
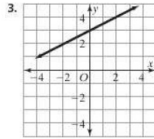
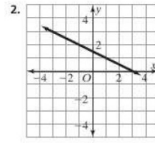
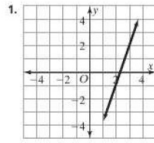


You have an assignment worksheet, due tomorrow

**Practice 4-1**

**Understanding Slope**

Find the slope of each line.



The points from each table lie on a line. Use the table to find the slope of each line. Then graph the line.

5. 

x	0	1	2	3	4
y	-3	-1	1	3	5

slope = \_\_\_\_\_

6. 

x	0	1	2	3	4
y	5	3	1	-1	-3

slope = \_\_\_\_\_

